Virginia Works Newsletter

Crystalline Silica- A Serious Health Hazard

Every year millions of workers in the U.S. are exposed to crystalline silica. Occupational exposure to crystalline silica dust causes or contributes to the development of silicosis, a disabling, irreversible, and sometimes fatal lung disease. Silica is a natural constituent of the earth's crust and is a major component of sand and granite. Crystalline silica, or free silica, is a term for the chemical compound silicon dioxide (Si02) when it occurs as a crystalline structure. Crystalline silica occurs naturally in many different forms, but the three most common forms are quartz (which is the most abundant), cristobalite, and tridymite. The most serious exposures result from quartz in the form of respirable dust produced by grinding, sandblasting, and mixing operations. Activities such as jack hammering, rock drilling, concrete mixing, concrete drilling, brick and concrete block or slab cutting and guniting are also associated with potential exposure to crystalline silica dust.

Crystalline silica affects the body when it is inhaled by causing fibrosis or scar tissue formation in the lungs. Personal air samples should be collected in the worker's breathing zone to ensure that exposures are kept below the permissible exposure limit (PEL) for silica. The PEL for crystalline silica is dependent on the amount of free silica that is present in the dust generated from the work operation. The PEL for respirable dust containing crystalline silica (quartz) described in the construction industry standards is measured in millions of particles per cubic foot (mppcf) and utilizes the impinger sampling method. However, the impinger method of counting dust particles has become obsolete and the gravimetric sampling method, which is used in general industry, is the preferred method of sampling. Comparative sampling has established that the two formulas are equivalent. Therefore, the same sampling method and formula used for the general industry pel can also be used in the construction industry. The general industry PEL, which is measured in milligrams per cubic meter (mg/m3), is calculated using the following formula:

$$\text{PEL} = \frac{10 \text{ mg/m3}}{\% \text{ silica} + 2}$$

(For cristobalite and tridymite forms, use 1/2 the value calculated from the same general industry formula.)

Crystalline silica represents a very serious health hazard. OSHA estimates that approximately 300 deaths are attributed to silicosis annually. Although current prevention approaches have contributed to the stabilization of the annual number of deaths with silicosis in the United States, silicosis can be 100% preventable if appropriate controls are used. General recommendations to reduce exposures to respirable crystalline silica in the workplace area as follows:

- Recognition of operations where silica dust may be generated and planning ahead to eliminate or control the dust at the source.
- Use of controls and containment methods, such as blast-cleaning machines and cabinets, wet drilling, or wet sawing of silica-containing material, to control the hazard and protect adjacent workers from exposure.

- Routine maintenance of dust control systems to keep them in good working order.
- Conducting air monitoring to measure worker exposure and ensure that controls are providing adequate protection to workers.
- Use of adequate respiratory protection when source controls cannot keep silica exposures below the PEL.
- Posting warning signs to mark the boundaries of work areas contaminated with respirable crystalline silica.
- Providing workers with training that includes information about health effects, work practices, and protective equipment for respirable crystalline silica.

To reduce and eliminate the workplace incidence of silicosis, VOSH has implemented a special emphasis program which covers most workplaces where exposure to crystalline silica may occur. This special emphasis program covers both general industry and construction worksites where employee exposure to crystalline silica may exist. More detailed information regarding silica is available through Federal OSHA's technical links web site. Just go to the OSHA homepage at http://www.osha.gov, click on the *Subject Index* and then click on the link for "*Silica*". Workers and employers can also obtain a package of materials on how to prevent silicosis by contacting the Office of Consultation Services at (804) 786-8707.

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